

LOW TIDES.

Eastport, Maine, 9th.

TEMPERATURE OF WATER.

The temperature of water as observed in rivers and harbors during June 1884, with the average depth at which the observations were made and the mean temperature of the air at the various stations, are given in the table below. The highest observed water temperatures are: 89°.4 at Indianola, Texas, 88°.4 at Key West, Florida, and 87°.0 at Galveston, Texas; the lowest are: 38°.2 at Marquette, Michigan, 40° at Eastport, Maine, and 40°.3 at Duluth, Minnesota. The greatest monthly ranges are: 23°.5 at Norfolk, Virginia, 22° at Duluth, Minnesota, 20°.4 at Chincoteague, Virginia, and 20°.1 at Cleveland, Ohio; the smallest are: 4°.3 at Savannah, Georgia, 4°.4 at San Francisco, California, and 5°.8 at Wilmington, North Carolina.

Temperature of water for June, 1884.

Station.	Temperature at bottom.		Range.	Average depth, feet and inches.		Mean temperature of the air at station.
	Max.	Min.		ft.	in.	
Atlantic City, New Jersey.....	72.0	59.4	12.6	4	7	66.4
Alpena, Michigan.....	71.7	60.0	11.7	12	2	61.5
Augusta, Georgia.....	80.7	70.6	10.1	11	2	74.2
Baltimore, Maryland.....	77.0	67.5	9.2	9	9	73.2
Block Island, Rhode Island.....	63.3	54.1	9.2	8	3	62.3
Boston, Massachusetts.....	65.6	53.9	11.7	21	1	66.0
Buffalo, New York.....	72.0	54.4	17.6	9	10	65.5
Canby, Fort, Washington.....	63.6	52.6	11.0	15	9	55.2
Cedar Keys, Florida.....	81.8	77.2	4.6	8	11	78.2
Charleston, South Carolina.....	83.6	74.4	9.2	43	8	75.6
Chicago, Illinois.....	69.2	52.8	16.4	4	4	65.0
Chincoteague, Virginia.....	81.0	60.6	20.4	4	3	69.1
Cleveland, Ohio.....	77.7	57.6	20.1	14	0	65.5
Detroit, Michigan.....	79.4	55.3	24.1	23	8	70.4
Delaware Breakwater, Delaware.....	78.7	59.1	19.6	9	4	67.1
Duluth, Minnesota.....	62.3	40.3	22.0	9	9	57.7
Eastport, Maine.....	49.1	40.0	9.1	15	5	57.4
Escanaba, Michigan.....	67.0	49.6	17.4	13	9	62.6
Galveston, Texas.....	87.0	78.7	8.3	12	6	81.5
Grand Haven, Michigan.....	80.1	64.5	15.6	13	0	67.9
Indianola, Texas.....	89.4	79.3	10.1	8	6	80.2
Jacksonville, Florida.....	84.1	74.3	9.8	18	0	76.9
Key West, Florida.....	88.4	79.7	8.7	15	9	81.7
Mackinaw City, Michigan.....	66.6	49.6	17.0	10	0	60.9
Macon, Fort, North Carolina.....	81.0	66.0	15.0	8	7	73.2
Marquette, Michigan.....	54.1	38.2	15.9	10	0	59.7
Milwaukee, Wisconsin.....	62.8	45.3	17.5	8	0	60.3
Mobile, Alabama.....	82.1	77.4	4.7	16	2	77.8
New Haven, Connecticut.....	74.7	57.7	17.0	15	8	66.8
New London, Connecticut.....	62.4	54.0	8.4	12	9	65.1
New York City.....	68.7	59.5	9.2	16	3	68.7
Norfolk, Virginia.....	86.0	62.5	23.5	16	10	73.4
Pensacola, Florida.....	81.3	76.5	4.8	17	7	75.6
Portland, Maine.....	53.3	48.7	4.6	10	2	66.3
Portland, Oregon.....	68.1	62.0	6.1	67	6	62.7
Sandusky, Ohio.....	78.5	61.0	17.5	11	11	69.9
Sandy Hook, New Jersey.....	71.2	56.3	14.9	1	10	68.4
San Francisco, California.....	62.5	58.1	4.4	39	1	59.0
Savannah, Georgia.....	78.3	74.0	4.3	10	2	75.6
Smithville, North Carolina.....	81.0	71.0	10.0	10	1	74.1
Toledo, Ohio.....	79.3	63.7	15.6	12	5	70.7
Wilmington, North Carolina.....	78.3	72.5	5.8	18	7	73.9

VERIFICATIONS.

INDICATIONS.

The detailed comparison of the tri-daily indications for June, 1884, with the telegraphic reports for the succeeding twenty-four hours, shows the general average percentage of verifications to be 83.44 per cent. The percentages for the four elements are: Weather, 85.97; direction of the wind, 78.39; temperature, 84.75; barometer, 90.90 per cent. By geographical districts, they are: For New England, 80.40; middle Atlantic states, 84.21; south Atlantic states, 84.39; eastern Gulf states, 85.94; western Gulf states, 83.30; lower lake region, 81.76; upper lake region, 82.18; Ohio valley and Tennessee, 85.88; upper Mississippi valley, 85.86; Missouri valley, 80.00; north Pacific coast region, 75.89; middle Pacific coast region, 91.67; south Pacific coast region, 89.17. There were eight omissions to predict out of 3,004, or 0.27 per cent. Of the 2,996 predictions that have been made, forty-nine, or 1.64 per cent., are considered to have entirely failed; one hundred and four, or 3.47 per cent., were one-fourth verified; four hun-

hundred and ten, or 13.68 per cent., were one-half verified; six hundred and fifty-seven, or 21.93 per cent., were three-fourths verified; 1,776, or 59.28 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

CAUTIONARY SIGNALS.

During June, 1884, eighty-nine cautionary signals were ordered. Of these, eighty, or 89.89 per cent., were justified by winds of twenty-five miles or more per hour at or within one hundred miles of the station. These do not include signals ordered at display stations where the velocity of the wind is only estimated. Seven signals were ordered late. No off-shore signals were ordered during the month. In forty-one cases winds of twenty-five miles or more per hour were reported for which no signals were ordered.

Professor T. C. Mendenhall, director of the "Ohio Meteorological Bureau," reports the following:

"The verification of the railway signals during the month was: for temperature, 93 per cent., and for rain, 77 per cent."

ATMOSPHERIC ELECTRICITY.

AURORAS.

Auroral displays occurred during June, as follows:

Fort Totten, Dakota: an auroral light was observed in the north at 8.30 p. m. on the 2d, the display consisting of shooting beams reaching an altitude of about 35°; at 11 p. m., a beam, 5° in width, extended across the sky—starting in the east and terminating on the western horizon; this beam was of a very bright color and remained visible until 2.25 a. m. of the 3d.

Saint Vincent, Minnesota: a faint aurora in the form of beams, having an altitude of 45°, was visible from 11 to 11.25 p. m. of the 2d.

Boston, Massachusetts: a faint auroral light of a whitish color, extending to an altitude of 15°, was observed in the northern sky at 11 p. m. of the 2d; the display continued until daylight of the following morning. At 8.30 p. m. of the 3d the aurora was again visible as a faint light, tinged with pink, reaching an altitude of 20°; this display disappeared at midnight.

Westborough, Massachusetts: an aurora was observed at 3 a. m. of the 3d.

Marquette, Michigan: an aurora, consisting of a faint whitish light, was visible from 12.15 a. m. until nearly daylight of the 4th.

Beloit, Wisconsin: an arch of auroral light, over a dark cloud, was observed on the 11th; altitude about 30°.

Fort Buford, Dakota: auroral beams of a pale whitish color were visible in the northeastern sky at 10.35 p. m., of the 13th; the beams apparently rose from a cumulus cloud at an elevation of 20° and extended to a height of 60°. An auroral display was also seen at this station on the 18th—beginning at 9.50 and continuing until 11.10 p. m. It appeared in the form of an arch of reddish color over a dark segment. The arch extended from northeast to northwest, and, at times, streamers rose from it, extending to a height of 65°.

Blooming Grove, Pennsylvania: a diffuse auroral light was observed in the north during the evening of 15th.

Milwaukee, Wisconsin: a display of the auroral light was observed from 9 to 11.45 p. m. of the 16th. The light was most intense in the northeast; in the north and northwest it was only visible in places. The display consisted of a faint glow over a dark segment, with occasional beams or flashes shooting up from the main body of the light.

Portland, Maine: a faint auroral light was seen between 8.30 and 9.30 p. m. of the 16th.

Helena, Montana: a faint aurora was discernible at about 9 p. m. of the 18th; it appeared in the form of a glow in the north where there were two or three beams of light; no traces of the display were visible at 9.20 p. m.

Fort Maginnis, Montana: a faint auroral light of pale bluish color, covering about 20° of the northern horizon, was observed between 9 and 10.20 p. m. of the 18th.

Moorhead, Minnesota: at 10.45 p. m. on the 18th was observed in the north an arc of light, 2° in width, resting on a base of haze; at 11 p. m. the arc broke into streamers, extending toward the zenith; at 11.45 only a dim light remained. A display, exhibiting no marked features, was also observed at this station at 11 p. m. of the 23d.

Escanaba, Michigan: a faint aurora was observed from 9.40 to 11.25 p. m. of the 18th; the light was of a pale yellowish color, and at times, was obscured by cirro-stratus cloud. A similar display also occurred during the night of the 23-24th, beginning at 10 p. m. and lasting until 12.33 a. m.

Cambridge, Massachusetts: an auroral arch was observed at 9 p. m., on the 18th.

Point Judith, Rhode Island: an auroral display, resembling the morning dawn, was seen at 1.30 a. m. of the 19th; it was obscured by fog at 2.15 a. m.

Oswego, New York: a faint auroral light of whitish color was observed in the north from 10 to 11.15 p. m. of the 22d.

Burlington, Vermont: from 2.15 until 2.45 a. m. of the 26th, a bright yellowish, auroral light was observed.

West Washington, District of Columbia: a diffuse auroral light was seen in the northern sky at 9 p. m. of the 26th, lasting an hour.

Syracuse, New York: a faint aurora was observed at 11 p. m. of the 30th.

Auroral displays are reported to have been observed at the following places—no descriptions nor time at which they were observed, being given:

Yutan, Nebraska, 13th, 15th, 20th, 21st, 23d.

Quakertown, Pennsylvania, 15th.

Vevay, Indiana, 17th, 19th.

Swartz Creek, Michigan, 18th, 22d.

Traverse City, Michigan, 22d.

Manchester, Iowa, 24th.

THUNDER-STORMS.

Thunder-storms have been reported in the various districts on the following dates:

New England.—2d, 3d, 5th to 10th, 13th, 19th, 20th, 21st, 23d to 26th.

Middle Atlantic states.—3d, 5th, 6th, 8th to 13th, 19th to 26th, 29th, 30th.

South Atlantic states.—6th to 16th, 19th to 22d, 24th to 30th.

Florida peninsula.—5th to 17th, 19th, 21st to 30th.

Eastern Gulf states.—3d to 10th, 12th to 18th, 20th to 30th.

Western Gulf states.—1st to 5th, 7th, 8th, 9th, 12th to 30th.

Rio Grande valley.—18th, 21st, 23d, 25th, 26th, 27th, 29th.

Tennessee.—2d, 3d, 5th to 14th, 17th to 30th.

Ohio valley.—2d, 3d, 6th to 14th, 17th to 25th, 27th, 30th.

Lower lake region.—1st to 10th, 12th, 13th, 17th to 25th, 30th.

Upper lake region.—1st to 9th, 12th, 16th to 24th, 30th.

Extreme northwest.—3d to 6th, 10th to 15th, 17th, 20th to 30th.

Upper Mississippi valley.—1st to 10th, 12th, 13th, 15th to 25th, 28th, 29th, 30th.

Missouri valley.—1st, 4th to 8th, 11th to 25th, 28th, 29th, 30th.

Northern slope.—1st to 11th, 13th to 16th, 19th to 24th, 26th to 30th.

Middle slope.—1st to 11th, 13th to 30th.

Southern slope.—1st, 2d, 4th to 8th, 11th to 20th, 22d, 26th.

Southern plateau.—1st, 6th, 10th, 13th to 16th, 18th to 21st, 26th to 30th.

Middle plateau.—1st to 4th, 12th, 13th, 15th, 21st, 25th, 27th.

Northern plateau.—2d to 5th, 9th, 11th, 12th, 13th, 18th, 19th, 21st, 22d, 23d, 25th.

North Pacific coast region.—1st, 2d, 4th, 8th, 14th, 18th, 21st, 22d, 23d, 25th, 26th, 28th, 30th.

Middle Pacific coast region.—Fort Gaston and Hydesville, California, 1st; Princeton, California, 1st to 4th; College City, California, 3d and 4th.

South Pacific coast region.—Los Angeles, California, 13th.

ELECTRICAL PHENOMENA.

The observer at Cantonment, Indian Territory, reports that a remarkable phenomenon is often witnessed at the "Red" hills about twenty-eight miles east of that station. The most prominent hill of that group—a ridge several miles in extent, is, during the prevalence of thunder storms, the scene of a wonderful electrical display, the lightning flashing along the entire length of the ridge. It is supposed to be due to this phenomenon that these hills are regarded by the Indians as a "medicine ground," and have long been used by them as a place for their superstitious religious ceremonies.

At West Las Animas, Colorado, between 8 and 9 p. m. of the 16th, the wind-vane was tipped with electric light.

The telegraph line at Fort Assinaboine, Montana, was affected by atmospheric electricity on the 16th.

The observer at Huron, Dakota, reports that at 3 p. m. of the 24th, a vivid flash of sheet lightning spread over the entire sky, the weather being perfectly clear at that time.

OPTICAL PHENOMENA.

SOLAR HALOS.

Solar halos were observed in the various districts on the following dates:

New England.—2d, 6th, 7th, 14th, 22d, 26th, 27th.

Middle Atlantic states.—6th, 7th, 10th, 13th, 14th, 24th, 28th.

South Atlantic states.—3d, 4th, 6th to 9th, 11th, 23d, 25th, 26th, 30th.

Florida peninsula.—4th, 5th, 15th, 16th, 20th.

Eastern Gulf states.—3d, 4th, 8th, 9th, 17th, 22d.

Western Gulf states.—2d, 6th, 7th, 9th, 11th, 13th, 19th, 20th.

Tennessee.—1st, 2d, 4th, 8th, 12th, 13th, 17th.

Ohio valley.—4th, 20th.

Lower lake region.—1st, 3d, 5th, 6th, 11th, 19th, 20th, 22d, 23d, 26th.

Upper lake region.—2d, 3d, 8th, 9th, 18th, 20th, 21st, 22d.

Upper Mississippi valley.—1st, 23d, 24th.

Missouri valley.—1st, 9th, 11th, 15th, 17th, 25th.

Middle slope.—13th.

Southern plateau.—11th.

Middle plateau.—3d, 5th to 10th, 21st.

Northern plateau.—3d, 4th, 5th, 7th.

North Pacific coast region.—6th, 17th, 19th, 21st.

Middle Pacific coast region.—2d, 3d, 6th, 11th, 15th, 17th, 20th, 27th.

South Pacific coast region.—3d.

Dr. J. B. Trembley, of Oakland, California, reports that during the early morning of the 3d the sky was overcast; at 8.30 a. m. it cleared; between 10 a. m. and 1 p. m. was visible one of the most brilliant solar halos that he has observed during a residence of many years at Oakland. The halo gave out, quite distinctly, the prismatic colors of the rainbow, and its brilliancy caused a peculiar shadow or obscurity to the sun's rays, resembling the darkness caused by the solar eclipse. Dr. Trembley states that it is worthy of remark that this brilliant solar halo preceded one of the severest storms (see "local storms") that ever occurred in that region during the month of June.

LUNAR HALOS.

Lunar halos were observed on the following dates in the various districts:

New England.—2d, 3d, 5th, 6th, 7th, 21st.

Middle Atlantic states.—3d to 9th, 30th.

South Atlantic states.—2d, 3d, 5th, 6th, 30th.

Florida peninsula.—5th.

Eastern Gulf states.—1st, 2d, 29th.

Western Gulf states.—4th, 7th, 8th, 9th, 13th, 15th, 19th.

Tennessee.—1st, 2d, 3d, 8th.

Ohio valley.—1st to 8th.

Lower lake region.—1st, 5th, 6th, 9th, 11th, 18th.

Upper lake region.—1st, 3d, 7th, 12th, 15th.

Upper Mississippi valley.—1st, 3d, 6th.